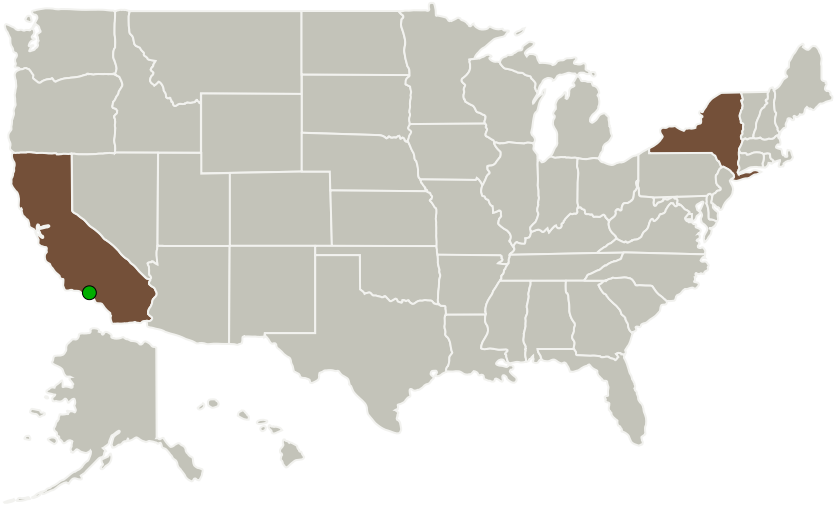
Low-Power Wideband Digital Spectrometer for Planetary Science, Phase I

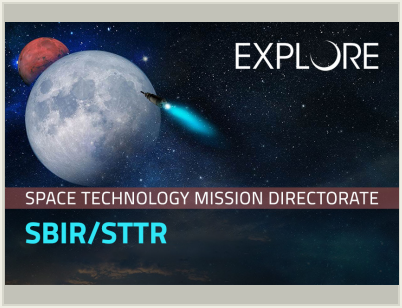
Completed Technology Project (2010 - 2010)

Project Introduction

The purpose of this project is to develop a wideband digital spectrometer to support space-born measurements of planetary atmospheric composition. The spectrometer is based on a superconducting digitizer and a digital autocorrelator. The digitizer will be able to handle the entire 6 -18 GHz band by operating above the Nyquist frequency (target: 30 GSamples/s). The superconducting circuits will be based on Niobium-based Rapid Single Flux Quantum (RSFQ) technology. They will be implemented without substantially impacting the cryogenic sensor package. The data from the superconducting digitizer will be processed by a 128-lag autocorrelator. During the Phase I performance period, we will determine whether the autocorrelator is best implemented using the RSFQ autocorrelator circuits we developed for the National Science Foundation, or the polyphase implementation we recently produced using fast FPGAs. The criteria for downselecting the best design will be the projected Signal-to-Noise ratios and the relative added terms to the system noise temperature. Our choice of Niobium superconductor technology will enable one single technology to implement the TerraHertz mixer, the digitizer, and the fast manipulation of digital data on a low-power low-temperature platform.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
HYPRES, Inc.	Lead Organization	Industry	Elmsford, New York
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	New York

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139191)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

HYPRES, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

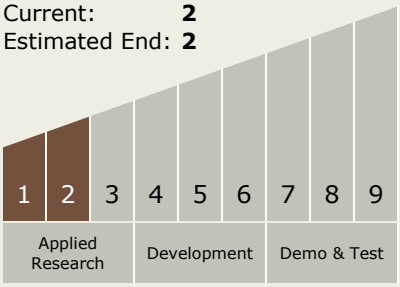
Carlos Torrez

Principal Investigator:

Steven B Kaplan

Technology Maturity (TRL)

Start: **1**
Current: **2**
Estimated End: **2**



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Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.2 Avionics Systems and Subsystems
    - TX02.2.6 Data Acquisition Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System